Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Original) A catalyst system comprising:
a polymerization catalyst; and
an activator comprising two or more heterocyclic nitrogen-containing ligands coordinated to a Group 13 atom, wherein the activator is a reaction product of one or more Group 13 atom-containing compounds and one or more heterocyclic nitrogen-containing compounds.

2. (Original) The catalyst system of claim 1, wherein the compounds are reacted at conditions sufficient for at least one proton located at a first position on at least one of the heterocyclic nitrogen-containing compounds to migrate to a second position upon nitrogen coordination to the Group 13 atom.

3. (Original) The catalyst system of claim 1, wherein the two or more heterocyclic nitrogen-containing ligands comprises at least one indolyl and at least one indolium.

4. (Original) The catalyst system of claim 1, wherein the two or more heterocyclic nitrogen-containing ligands comprises at least one carbazole and at least one carbazolyl.

5. (Currently amended) The catalyst system of claim 1, further comprising a support material treated with aluminoxane or an alkyl aluminum compound such that the support comprises aluminum alkyls groups bonded thereto.

6. (Currently amended) The catalyst system of claim 1, wherein the one or more heterocyclic nitrogen-containing compounds is selected from the group consisting of pyrroles, imidazoles, pyrazoles, pyrrolines, pyrrolidines, purines, carbazoles, indoles,

phenyl indoles, 2,5, dimethyl pyrroles, 3-pentafluorophenyl pyrrole, 3,4 difluoropyrroles, and combinations thereof.

7. (Original) The catalyst system of claim 1, wherein the one or more heterocyclic nitrogen-containing compounds comprises at least one indole selected from the group consisting of 4-bromoindole, 4-chloroindole, 4-fluoroindole, 5-bromoindole, 5-chloroindole, 5-fluoroindole, 4,5,6,7-tetrafluoroindole, 2-methylindole, and 3-methylindole.

8. (Original) The catalyst system of claim 1, wherein the heterocyclic compound is substituted with one or more substituent groups selected from the group consisting of a halogen atom and a halogen atom-containing group.

9. (Original) The catalyst system of claim 1, wherein the heterocyclic compound is substituted with one or more substituent groups selected from the group consisting of chlorine, bromine, iodine, and fluorine.

10. (Original) The catalyst system of claim 1, wherein the polymerization catalyst comprises one or more metallocenes.

11. (Original) The catalyst system of claim 1, wherein the Group 13 atom comprises aluminum or boron.

12. (Original) A catalyst system, comprising:
a polymerization catalyst; and
at least one activator represented by any one of the following formulas:

(a) $(R'_x M (JY)_y)_n$ or

(b) $[((JY)_y R'_x)_n M-O-M ((R'_x (JY)_y)_n]_m$ or

(c) $(OMR'_x(JY)_y)_n$

wherein:

M is a Group 13 atom;

O is oxygen;

(JY) is a heterocyclic nitrogen-containing ligand coordinated to M;

R' is a substituent group bonded to M;

x is an integer from 0 to 4;

y is 2 or more;

x + y = the valence of M in formula (a); x + y = the valence of M - 1 in formula (b); and x + y = valence of M - 2 in formula (c);

n is 1 or 2 in formula (a); n is 2 in formula (b); and n is an number from 1 to 1,000 in formula (c); and

m is a number from 1 to 10.

13. (Original) The catalyst system of claim 12, wherein the activator is a reaction product of one or more Group 13 atom-containing compounds and one or more heterocyclic nitrogen-containing compounds.

14. (Original) The catalyst system of claim 12, wherein the activator is a reaction product of one or more Group 13 atom-containing compounds and one or more heterocyclic nitrogen-containing compounds, and the compounds are reacted at conditions sufficient for at least one proton located at a first position on at least one of the heterocyclic nitrogen-containing compounds to migrate to a second position upon nitrogen coordination to the Group 13 atom.

15. (Original) The catalyst system of claim 12, wherein $(JY)_y$ comprises at least one indolyl and at least one indolium.

16. (Original) The catalyst system of claim 12, wherein $(JY)_y$ comprises at least one carbazole and at least one carbazolyl.

17. (Original) The catalyst system of claim 12, further comprising a support material treated

with aluminoxane or an alkyl aluminum compound such that the support comprises aluminum alkyls groups bonded thereto.

18. (Original) The catalyst system of claim 12, wherein the heterocyclic nitrogen-containing compounds is selected from the group consisting of pyrroles, imidazoles, pyrazoles, pyrrolines, pyrrolidines, purines, carbazoles, indoles, phenyl indoles, 2,5, dimethyl pyrroles, 3-pentafluorophenyl pyrrole, 3,4 difluoropyrroles, and combinations thereof.

19. (Original) The catalyst system of claim 12, wherein the one or more heterocyclic nitrogen-containing compounds includes at least one indole selected from the group consisting of 4-bromoindole, 4-chloroindole, 4-fluoroindole, 5-bromoindole, 5-chloroindole, 5-fluoroindole, 4,5,6,7-tetrafluoroindole, 2-methylindole, and 3-methylindole.

20. (Original) The catalyst system of claim 12, wherein the heterocyclic compound is substituted with one or more substituent groups selected from the group consisting of a halogen atom and a halogen atom containing group.

21. (Original) The catalyst system of claim 12, wherein the heterocyclic compound is substituted with one or more substituent groups selected from the group consisting of chlorine, bromine, iodine, and fluorine.

22. (Original) The catalyst system of claim 12, wherein the polymerization catalyst comprises one or more metallocenes.

23. (Original) The catalyst system of claim 12, wherein the Group 13 atom comprises aluminum or boron.

24. (Original) The catalyst system of claim 12, wherein the polymerization catalyst comprises one or more metallocenes, Group 15-containing compounds, phenoxide transition metal compositions, Group 5 or 6 metal imido complexes, bridged

bis(arylamido) Group 4 compounds, derivates thereof, or combinations thereof.

25. (Original) The catalyst system of claim 12, wherein each R' is independently selected from the group consisting of hydrogen, linear or branched alkyl radicals, linear or branched alkenyl radicals, linear or branched alkynyl radicals, cycloalkyl radicals, aryl radicals, acyl radicals, aroyl radicals, alkoxy radicals, aryloxy radicals, alkylthio radicals, dialkylamino radicals, alkoxycarbonyl radicals, aryloxycarbonyl radicals, carbomoyl radicals, alkyl radicals, dialkyl radicals, carbamoyl radicals, acyloxy radicals, acylamino radicals, aroylamino radicals, straight alkylene radicals, branched alkylene radicals, cyclic alkylene radicals, derivatives thereof, and combinations thereof.

26. (Original) The catalyst system of claim 12, wherein each R' is bonded to the support material and is independently selected from the group consisting of hydrogen, linear or branched alkyl radicals, linear or branched alkenyl radicals, linear or branched alkynyl radicals, cycloalkyl radicals, aryl radicals, acyl radicals, aroyl radicals, alkoxy radicals, aryloxy radicals, alkylthio radicals, dialkylamino radicals, alkoxycarbonyl radicals, aryloxycarbonyl radicals, carbomoyl radicals, alkyl radicals, dialkyl radicals, carbamoyl radicals, acyloxy radicals, acylamino radicals, aroylamino radicals, straight alkylene radicals, branched alkylene radicals, cyclic alkylene radicals, derivatives thereof, and combinations thereof.

27. (Original) An aluminum activator comprising two or more heterocyclic nitrogen-containing ligands coordinated to an aluminum atom.

28. (Original) The compound of claim 27, wherein the coordination of the heterocyclic nitrogen containing ligands to the aluminum atom causes a proton on at least one of the ligands to migrate from a first position thereof to a second position thereof.

29. (Original) The compound of claim 27, wherein the activator is a reaction product of one or more Group 13 atom-containing compounds and one or more heterocyclic nitrogen-containing compounds selected from the group consisting of pyrroles, imidazoles,

pyrazoles, pyrrolines, pyrrolidines, purines, carbazoles, indoles, phenyl indoles, 2,5, dimethyl pyrroles, 3-pentafluorophenyl pyrrole, 3,4 difluoropyrroles, derivatives thereof, radicals thereof, and combinations thereof.

30. (Original) The compound of claim 27, wherein the two or more heterocyclic nitrogen-containing ligands comprise at least one indolyl and at least one indolium coordinated to the aluminum atom.

31. (Original) The compound of claim 27, wherein the two or more heterocyclic nitrogen-containing ligands comprise at least one carbazole and at least one carbazolyl coordinated to the aluminum atom.

32. (New) A catalyst system comprising:
a polymerization catalyst; and
an activator comprising two or more heterocyclic nitrogen-containing ligands coordinated to a Group 13 atom, wherein the activator is a reaction product of one or more Group 13 atom-containing compounds and one or more heterocyclic nitrogen-containing compounds; wherein the compounds are reacted at conditions sufficient for at least one proton located at a first position on at least one of the heterocyclic nitrogen-containing compounds to migrate to a second position upon nitrogen coordination to the Group 13 atom.

33. (New) A catalyst system, comprising:
a polymerization catalyst; and
at least one activator represented by any one of the following formulas:

(a) $(R'_x M (JY)_y)_n$ or

(b) $[((JY)_y R'_x)_n M-O-M ((R'_x (JY)_y)_n]_m$ or

(c) $(OMR'_x(JY)_y)_n$

wherein:

M is a Group 13 atom;

O is oxygen;

(JY) is a heterocyclic nitrogen-containing ligand coordinated to M;

R' is a substituent group bonded to M;

x is an integer from 0 to 4;

y is 2 or more;

x + y = the valence of M in formula (a); x + y = the valence of M - 1 in formula (b); and x + y = valence of M - 2 in formula (c);

n is 1 or 2 in formula (a); n is 2 in formula (b); and n is an number from 1 to 1,000 in formula (c); and

m is a number from 1 to 10;

wherein the activator is a reaction product of one or more Group 13 atom-containing compounds and one or more heterocyclic nitrogen-containing compounds, and the compounds are reacted at conditions sufficient for at least one proton located at a first position on at least one of the heterocyclic nitrogen-containing compounds to migrate to a second position upon nitrogen coordination to the Group 13 atom.